

Donaldson® Corporate Technology

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To: Doug Crofoot

Date: 1/5/99

[REDACTED]

FY'98 FINE FIBER CORE PROGRAM

II. Process improvements, understanding and technology transfer

Deliverables:

[REDACTED]

[REDACTED]



III. Polymer Development

Objective:

Provide a continuous stream of new polymers that address current and long range needs of fine fiber media for processibility, material compatibility or other special requirements.

Deliverables:

Continue support of the introduction of FP2X for GTS and engine applications.

Progress to date:

I talked to Doyce Burnett of Barber Threads, Inc. on 12/9/98 about supplying DCI with the 819 resin. He confirmed that they had gone out of this resin business due to the escalating costs, which relate to the disposal of the waste stream. They were also concerned because they operate within the city limits. They tried several alternatives to the 800 series resin, but were unsuccessful. Barber resumed production of the 829 resin in their application because of periodic stability problems with the 819 resin solution. He stated that they are in production for the long term. I questioned him about available capacity to DCI and he said Barber could supply us with up to 15,000 - 20,000 pounds per year. At this time, GTS would require ~3,000 pounds per year to switch to FP2X. If Torit also switched, DCI would require ~10,000 pounds per year. Mr. Burnett offered to make us one 300# batch of 819 to study. The process and the equipment are the same as in the past, but they have a new operator. Robyn Bryan, the old operator has left the company. He also mentioned that Dr. Orwoll (VP - R&D) has left the company. Bill Stucky now heads the R&D function. I asked Mr. Burnett to contact Paul Krenik so that we could arrange a visit to Barber in January or February.

The cost increase for GTS to switch to FP2X is estimated at %3.3 based on the current FP2 price quote of \$70/pound from Supplier P. If we can use the FP2 resin from Barbour at \$35/pound the cost increase for FP2X for GTS would decline to %1.4.

Four lots of BCI 819 resin, representing the range of material produced, were blended in the FP2X polymer system and spun on R5 for comparison to FP2X using FP2 resin made at Supplier P. There are significant differences between the two FP2X polymer systems.

- FP2X polymer solutions made with BCI FP2 produce solutions that are not stable enough to be run in production. The viscosity increases too rapidly to produce a consistent LH fiber size or efficiency layer.
- BCI FP2X requires a higher solids content to achieve a similar viscosity to a PC FP2X solution. BCI FP2 has a much lower molecular weight due to the feed material.
- SEM photos show a much higher degree of fiber flow in the BCI samples. This probably explains the larger fiber size and lower FoM in the BCI samples.

The above results do not rule out Barbour as a potential supplier of the FP2 resin. The BCI material used in these experiments is five years old. All four lots of resin are currently being tested in the analytical lab to determine if they have changed during storage. Those results are pending. BCI used waste feed materials to produce their resin compared to virgin feed materials for PC. BCI intentionally produced resin with a lower substitution level and therefore lower solution stability to meet their own internal needs. We should be able to produce the same quality FP2 resin at Barbour as we do at PC if we use virgin feed material and utilize what we have learned about the process at PC.

FP2X Spinning Results

FP2 Source	BCI Average	PC Average
% Solids	13.0	12.0
Initial Viscosity	45.2	44.5
% LH Pen	7.2	2.8
LH FoM	416	611
% LH Pen after EtOH soak	10.1	5.6
% LH Eff Retained after EtOH soak	96.9	97.1
LH FoM after EtOH soak	331	404
Fiber size (micron)	0.208	0.176
Fiber length (mm)	2812	3339
Fiber volume	9.71E-05	8.11E-05

Viscosity

<u>Data</u>	<u>Lot #</u>	<u>Initial</u>	<u>1 Day</u>	<u>2 Days</u>	<u>3 Days</u>	<u>4 Days</u>	<u>4 WEEKS</u>	<u>5 WEEKS</u>
	BCI 1769	43.8	49.5	58.6	70.2	100.4	gelled	gelled
	BCI 1786	44.9	62	98.5	gelling	gelled	gelled	gelled
	BCI 1794	45.1	52.2	61.5	75.6	-----	gelled	gelled
	BCI 1824	46.8	87.6	gelling	gelled	gelled	gelled	gelled
	PC	46.4	-----	-----	-----	-----	44.9	52.0